Lesson 8.3 Population Dynamics

Name

Date

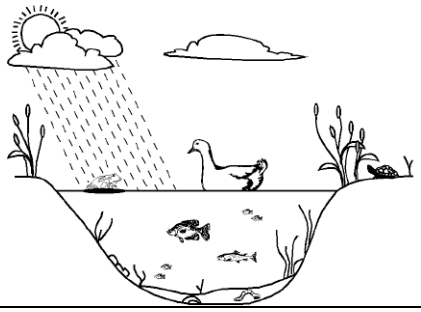
Period

Key Terms		
Ecosystem	Demography	Carrying capacity

Engage

In the last lesson you learned about some of the basic relationships between organisms: predator – prey relationships, and symbiotic relationships including mutualism, commensalism, and parasitism. An ecosystem is built on relationships *between organisms* (biotic factors) and the *physical environment* (abiotic factors). Today you will investigate population data of members within an ecosystem and make inferences based on that data.

I.

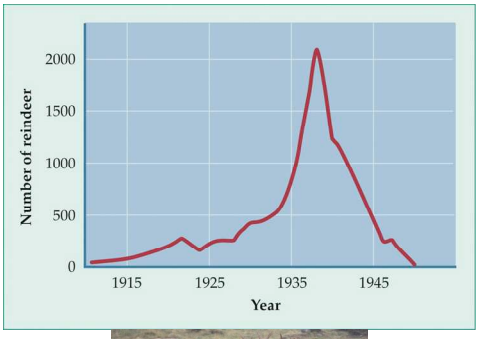


Examine this diagram.

1. List all of the features that are living (biotic) in this ecosystem.

2. List all of the features that are non-living (abiotic) in this ecosystem.

II.



Read the following passage and examine the graph.

Reindeer were introduced to St. Paul Island in 1911. The island's 106 square kilometers (41 square miles) was an undisturbed environment and supported no major predators. The initial herd of 4 males and 21 females grew continuously to about 2,000 animals in 1938. The population collapsed to just 8 animals in 1950.

3. What happened on this island between 1911 and 1938? Why?

4. What happened on this island from 1938 to 1950? Why?

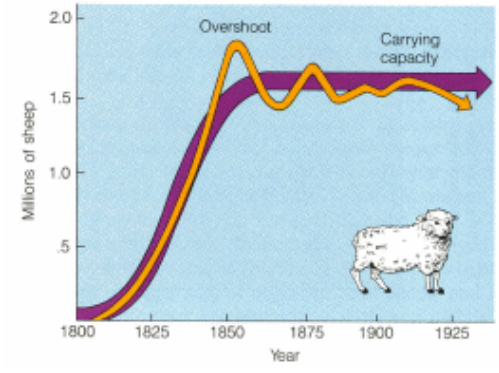
5. What are the biotic and abiotic features that are connected to this pattern of data?

Explore

You will now investigate several different sets of data and descriptions. Answer the questions for each investigation.

Problem 1

Sheep are a non-native species that were introduced to New Zealand between 1800-1825.



6. What story does this graph tell about the population of sheep in New Zealand?

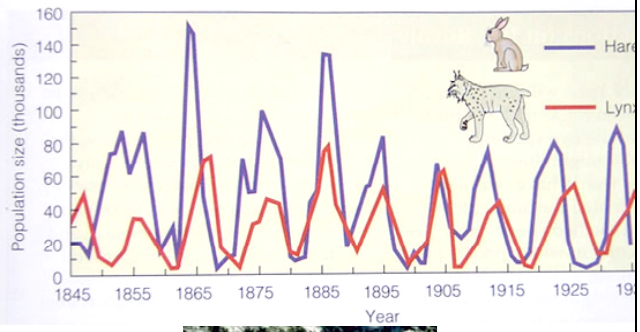
7. What role did the abiotic factors play in the story told by this graph?

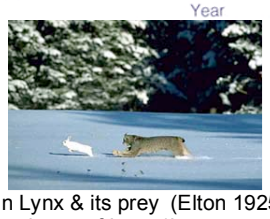
8. What role did the biotic factors play in the story told by this graph?

9. What do you think the term "overshoot" means?

10. What do you think the term carrying capacity means?

Problem 2





Population cycles in Lynx & its prey (Elton 1925)
Changes in the abundance of Lynx (*Lynx canadensis*) and various prey species such as Snowshoe Hare (*Lepus americana*) are documented in records of the numbers of pelts brought into the Hudson Bay Company.

Watch: http://www.youtube.com/watch?v=xWm6037urxs

11. What story does this graph tell about the population of Lynx and hare?

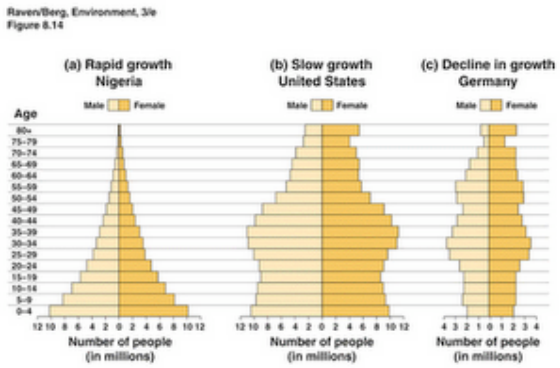
12. What role did the abiotic factors play in the story told by this graph?

13. What role did the biotic factors play in the story told by this graph?

14. Why do you think the population of hare went so high in 1862?

15. Why don't the patterns match up exactly?

Problem 3



Demography: the study of factors that affect growth & decline of populations

These factors can be such things as Birthrate (natality)~ # of offspring produced

Death rate (mortality)~ # of individuals that die

To the left you see an age structure diagram. It shows the relative number of individuals of each age within the population.

16. Compare the growth rates of each of the countries. Which country do you expect to have more people now? Explain.

17. What factors, abiotic and biotic, do you think make the first diagram so different from the second two? Explain in your own words.

18. Which population do you think is not growing? Explain your choice.

Explain *Practice your understanding...*

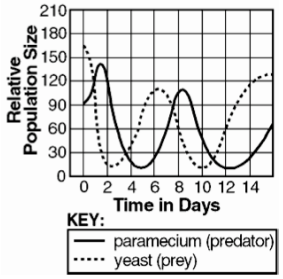
19. Temperature, O_2, CO_2, air pressure and light are all examples of

a) biotic factors b) abiotic factors c) biomes d) ecosystems

20. The number of field mice in a pasture is an example of a(n)

a) biotic factor b) abiotic factor c) biome d) ecosystem

21. The graph below represents a predator-prey relationship.



What is the most probable reason for the increasing predator population from day 5 to day 6?

A) the decreasing prey population from day 1 to day 2

B) a predator population equal in size to the prey population from day 5 to day 6

C) the extinction of the yeast on day 3 and day 10

D) an increasing food supply from day 5 to day 6

22. A field study was conducted to observe a deer population in a given region over time. The deer were counted at different intervals over a period of 40 years. During this period of time, both ranching and hunting increased in the study region. A summary of the data is presented in the table below.

DATA TABLE

Year	Deer Population (thousands)
1900	3.0
1910	9.5
1920	65.0
1924	100.0
1926	40.0
1930	25.0
1940	10.0

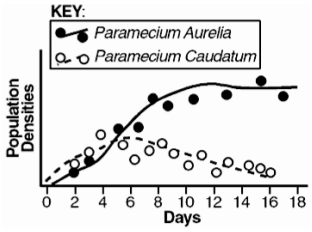
During which 10-year period did the *greatest* increase in the deer population occur?
A) 1900-1910 B) 1910-1920 C) 1930-1940 D) 1920-1930

23. Explain why you see a steady rise in the population from 1900-1924.

24. Explain why you see a steady drop in the population from 1924-1940.

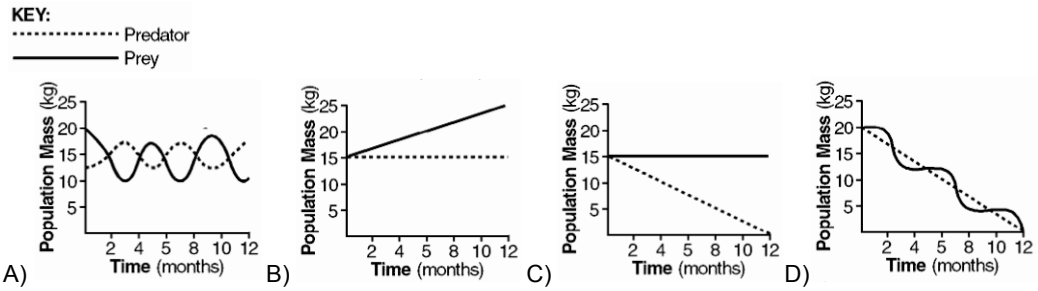
25. How large do you think the deer population would be in 1960 if land use conditions stayed the same? Explain your reasoning.

26.The graph below shows the rates of growth of populations of *Paramecium aurelia* and *Paramecium caudatum* when cultured together.

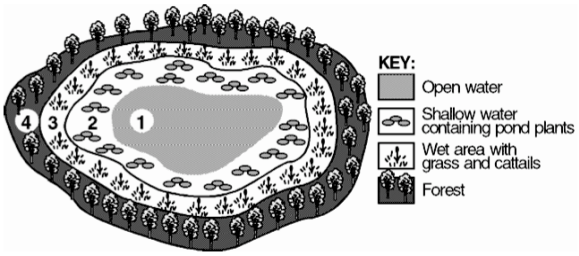


The results observed are most likely caused by
A) reduced enzyme activity
B) competition
C) commensalism
D) lack of water

27. Which graph *best* represents a predator-prey relationship in a stable ecosystem?



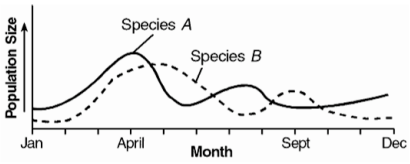
Questions 28 and 29 refer to the following:
The map below of the vegetation around a small pond in a temperate deciduous forest was drawn by an ecologist.



28. An abiotic factor that has a great effect on area 3 is the
A) concentration of herbivores
B) annual precipitation
C) speed of water currents
D) concentration of algae

29. Which area is *least* affected by daily changes in atmospheric temperature?
A) 2 B) 1 C) 3 D) 4

30.The graph below represents the population growth curves of two different species of aquatic organisms, *A* and *B*.



What is a valid prediction based on this graph?
A) Species *A* will not be present in the water during the winter months.
B) Species *A* will eliminate species *B* from the water after 1 year.
C) Species *B* will attain maximum population size each autumn due to a decrease in water temperature.
D) Species *B* will decrease in population size approximately 1 month after a decrease in the population size of species *A*.